CLAIMS

We claim:

1 A magnetic sensor, comprising:

a. at least one coil operatively associated with a magnetic circuit of a vehicle body, wherein said at least one coil is adapted to cooperate with a time-varying magnetic flux in said vehicle body, said time-varying magnetic flux is generated or sensed by said at least one coil, and said time-varying magnetic flux is responsive to a condition of said vehicle body that is sensed by the magnetic sensor; and

b. at least one electrical circuit operatively coupled to said at least one coil, wherein said at least one electrical circuit is adapted so that said at least one coil in cooperation with said at least one electrical circuit exhibits a resonant or near-resonant condition in association with said time-varying magnetic flux for at least one condition of said vehicle body.

2 A magnetic sensor as recited in claim **1**, wherein said magnetic circuit comprises at least one ferromagnetic element of said vehicle body.

3 A magnetic sensor as recited in claim **1**, wherein said at least one condition of said vehicle body comprises a nominal condition of said vehicle body.

4 A magnetic sensor as recited in claim **1**, wherein said at least one condition of said vehicle body comprises a deformed condition of said vehicle body.

5 A magnetic sensor as recited in claim **1**, wherein said at least one condition of said vehicle body comprises a defective condition of said vehicle body.

6 A magnetic sensor as recited in claim **1**, wherein said at least one electrical circuit comprises a first electrical circuit comprising:

a. at least one first coil of said at least one coil;

b. at least one first capacitor in series with said at least one first coil; and

c. an oscillator, wherein said oscillator generates a first signal that is applied to said at least one first coil, and a first resonant frequency of said at least one first coil in combination with said at least one first capacitor is at or near a frequency of said first signal for at least one condition of said vehicle body.

7 A magnetic sensor as recited in claim **6**, wherein said oscillator comprises a sinusoidal oscillator.

8 A magnetic sensor as recited in claim **6**, wherein said oscillator comprises a square wave oscillator.

9 A magnetic sensor as recited in claim **6**, wherein said first electrical circuit is adapted so that said first signal applied to said at least one first coil is a mono-polar signal.

10 A magnetic sensor as recited in claim **6**, wherein said at least one coil is adapted so as to incorporate an inherent capacitance of a magnitude sufficient to provide for filtering a harmonic component of said first signal.

11 A magnetic sensor as recited in claim **6**, wherein a resistance of said at least one coil is greater that a total resistance of the remainder of elements of said at least one electrical circuit in series with said at least one coil and driven by said oscillator.

12 A magnetic sensor as recited in claim **6**, wherein said at least one electrical circuit comprises at least one resistor in series with said at least one first coil.

13 A magnetic sensor as recited in claim **12**, wherein a total resistance of said at least one resistor is less than a resistance of said at least one first coil.

14 A magnetic sensor as recited in claim **6**, wherein said electrical circuit is adapted for sensing at least one measure selected from a voltage across said at least one first coil, a current through said at least one first coil, a voltage across a resistor in series with said at least one first coil, and a voltage across said at least one first capacitor.

15 A magnetic sensor as recited in claim **6**, further comprising a processor, a circuit, or a combination thereof adapted to determine at least one measure selected from a measure responsive to or related to an inductance of said at least one first coil, a measure responsive to or related to a resistance of said at least one first coil, a measure responsive to a phase angle between a voltage across said at least one first coil and a current through said at least one first coil, a measure of reactive power applied to said at least one first coil, and a measure of real power absorbed by said at least one first coil.

16 A magnetic sensor as recited in claim **6**, wherein said at least one first capacitor comprises first and second capacitors, and said at least one first coil is connected between said first and second capacitors.

17 A magnetic sensor as recited in claim **1**, wherein said at least one electrical circuit comprises a second electrical circuit comprising:

a. at least one second coil of said at least one coil; and

b. at least one second capacitor in parallel with said at least one second coil, wherein a second resonant frequency of said at least one second coil in combination with said at least one second capacitor is at or near an oscillation frequency of said time-varying magnetic flux coupled to said at least one second coil for at least one condition of said vehicle body.

18 A magnetic sensor as recited in claim **17**, wherein said second electrical circuit generates a second signal responsive to said time-varying magnetic flux coupled to said at least one second coil, and said second electrical circuit is adapted so that said second signal is mono-polar.

19 A magnetic sensor as recited in claim **6**, wherein said at least one electrical circuit comprises a second electrical circuit comprising:

a. at least one second coil of said at least one coil; and

b. at least one second capacitor in parallel with said at least one second coil, wherein a second resonant frequency of said at least one second coil in combination with said at least one second capacitor is at or near an oscillation frequency of said time-varying magnetic flux coupled to said at least one second coil for at least one condition of said vehicle body, and said second resonant frequency is substantially equal or near to said frequency of said first signal for at least one condition of said vehicle body.

20 A method of sensing a condition of a magnetic circuit, comprising:

a. operatively associating at least one coil with the magnetic circuit so that a time-varying magnetic flux in said magnetic circuit is magnetically coupled with said at least one coil;

b. operatively coupling said at least one coil to at least one electrical circuit;

c. adapting said at least one electrical circuit so that an oscillation frequency of said time-varying magnetic flux is substantially at or near a resonant frequency of said at

least one coil in cooperation with said at least one electrical circuit for at least one condition of said magnetic circuit; and

d. sensing a condition of said magnetic circuit from a signal associated with said at least one electrical circuit responsive to said at least one coil.

21 A method of sensing a condition of a magnetic circuit as recited in claim **20**, wherein the operation of adapting said at least one electrical circuit comprises operatively coupling at least one first capacitor in series with at least one first coil of said at least one coil, and applying an oscillatory first signal in series with said at least one first coil.

22 A method of sensing a condition of a magnetic circuit as recited in claim **21**, wherein the operation of sensing a condition of said magnetic circuit comprises:

a. sensing a signal selected from a voltage across said at least one first coil, a current through said at least one first coil, a voltage across a resistor in series with said at least one first coil, and a voltage across said at least one first capacitor, and

b. comparing said signal with a threshold.

23 A method of sensing a condition of a magnetic circuit as recited in claim **22**, further comprising sensing from said signal the operativeness of said electrical circuit including said at least one first coil.

24 A method of sensing a condition of a magnetic circuit as recited in claim **21**, wherein the operation of sensing a condition of said magnetic circuit comprises:

a. sensing a signal selected from a measure responsive to or related to an inductance of said at least one first coil, a measure responsive to or related to a resistance of said at least one first coil, a measure responsive to a phase angle between a voltage across said at least one first coil and a current through said at least one first coil, a measure of reactive power applied to said at least one first coil, and a measure of real power absorbed by said at least one first coil; and

b. comparing said signal with a threshold.

25 A method of sensing a condition of a magnetic circuit as recited in claim **22**, further comprising sensing from said signal the operativeness of said electrical circuit including said at least one first coil.

26 A method of sensing a condition of a magnetic circuit as recited in claim **21**, wherein the operation of sensing a condition of said magnetic circuit comprises varying a frequency of said oscillatory first signal and sensing a response from said at least one electrical circuit responsive to said frequency.

27 A method of sensing a condition of a magnetic circuit as recited in claim **20**, wherein the operation of adapting said at least one electrical circuit comprises operatively coupling at least one second capacitor in parallel with a second coil of said at least one coil so as to form a parallel circuit, and the operation of sensing a condition of said magnetic circuit comprises sensing a voltage across said parallel circuit responsive to said time-varying magnetic flux in said magnetic circuit.

28 A method of sensing a condition of a magnetic circuit as recited in claim **20**, wherein said at least one coil is operatively associated with a vehicle body, said magnetic circuit comprises a door of the vehicle, and said condition of said magnetic circuit comprises whether or not said door is latched.

29 A method of sensing a condition of a magnetic circuit as recited in claim **20**, wherein said at least one coil is operatively associated with a vehicle body, said magnetic circuit comprises a door of the vehicle, and said condition of said magnetic circuit comprises whether or not said door is involved in a crash, further comprising controlling the actuation of a safety restraint system responsive to sensing said condition that said door is involved in said crash.